Claims

We claim:

- 1 1. A method for processing a plurality of videos, comprising:
- 2 acquiring, in parallel, a plurality of compressed videos, in which
- 3 compressed frames of each input video are acquired at a fixed sampling rate;
- 4 applying, concurrently and in parallel, joint analysis to the plurality of
- 5 compressed videos to determine a variable and non-uniform temporal
- 6 sampling rate for each compressed video, so that a combined distortion is
- 7 minimized while a combined frame rate constraint is satisfied for the
- 8 plurality of compressed videos; and
- 9 sampling compressed frames of each compressed video at the
- 10 associated variable and non-uniform temporal sampling rate to produce a
- 11 plurality of compressed output videos having variable temporal resolutions.
 - 1 2. The method of claim 1, further comprising:
 - 2 storing the plurality of compressed output videos in a persistent
 - 3 memory.
 - 1 3. The method of claim 1, in which the compressed frames are intra-frames.
 - 1 4. The method of claim 3, in which the compressed videos are JPEG videos.
 - 1 5. The method of claim 3, in which the compressed videos are MPEG
 - 2 videos.

- 1 6. The method of claim 1, further comprising:
- 2 acquiring the plurality of compressed videos with a plurality of
- 3 surveillance cameras.
- 1 7. The method of claim 1, further comprising:
- 2 acquiring the plurality of compressed videos with a plurality of
- 3 broadcast studio cameras.
- 1 8. The method of claim 3, in which the combined distortion includes a
- 2 temporal distortion.
- 1 9. The method of claim 8, in which the temporal distortion is determined
- 2 from compressed-domain information of the intra-frames.
- 1 10. The method of claim 9, in which the compressed domain information
- 2 includes DCT coefficients.
- 1 11. The method of claim 1, further comprising:
- 2 decoding partially the plurality of compressed videos before applying
- 3 the joint analysis.

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- 1 12. The method of claim 1, in which the compressed frames are inter-frames.
- 1 13. The method of claim 12, in which the temporal distortion is determined
- 2 directly from motion vectors in the inter-frames.

- 1 14. The method of claim 12, in which the compressed frames are MPEG-1/2
- 2 P/B-frames.
- 1 15. The method of claim 12, in which the compressed frames are MPEG-4
- 2 P/B-video object planes.
- 1 16. The method of claim 12, in which the combined distortion includes a
- 2 temporal distortion.
- 1 17. The method of claim 16, in which the temporal distortion $E\{\Delta^2 z_{i,k}\}$
- between a frame *i* and frame *k* is estimated by $E\{\Delta^2 z_{i,k}\} = \sigma_{x_i}^2 \sigma_{\Delta x_{i,k}}^2 + \sigma_{y_i}^2 \sigma_{\Delta y_{i,k}}^2$,
- 3 where $(\sigma_{x_i}^2, \sigma_{y_i}^2)$ represent a variances for x and y spatial gradients in frame i,
- 4 and $(\sigma_{\Delta x_{i,k}}^2, \sigma_{\Delta y_{i,k}}^2)$ represent variances for motion vectors between the frame i
- 5 and frame k in x and y direction.
- 1 18. The method of claim 17, wherein spatial gradients are determined
- 2 directly from DCT coefficients in the frames.
- 1 19. The method of claim 12, further comprising:
- 2 transcoding the output compressed videos.